

CATALOGUS
EUPHORBIARUM III

Section XXVI - Tithymalus

384 -- 692

Shrubs or herbs, never succulent or stemless, distributed over the entire world but more frequent in temperate zones. Leaves rarely ternate, rarely opposite. Inflorescence constant, mostly umbel-like disposed. Glands flat, entire, rounded on both sides (the apex), 4 to 5, rarely more. The bracteoles among the male flowers feather-like, sometimes missing. Seeds with or without caruncula.

Boissier subdivides the section Tithymalus into eleven sub-sections.

Subs. 1	Decussatae	(384)	1	Italia, Mex., Peru	E. lathyris L.
2	Oppositifolia	(385-389)	5	Sungaria, Persia	
3	Crotonopsidae	(390)	1	Orient, Syria, Persia	E. lanata
4	Ipecacuanhae	(391-409)	19	American	
5	Laurifoliae	(410-416)	7	American	Euphorbiodendron
6	Osyridae	(417)	1	Persia, Austral.	E. osyridae
7	Pachycladae	(418-431)	14	Insulares	
8	Carunculares	(432-438)	7	Medit. Orient	
9	Galarrhoei	(439-546)	108	Herbae Tot. Orb. Temp.	
					Herbae et Frutices
10	Esulae	(547-685)	139	Herbae Tot. Orb. Temp.	
					Herbae et Frutices
11	Myrsinitae	(686-692)	7	Herb. Medit. Orient.	

TITHYMALUS has been described in various ways. According to Boissier 1862, Species 384-692, "Tithymalus leaves alternate, rarely opposite, floral leaves opposite or ternate, stipules none, glands lack petaloid appendices, margin entire or serrate, gland sometimes bihorned, margin or gland rarely pectinate".

In other words, TITHYMALUS lacks positive characteristics. The only three constant ones are also all three negative - (1) the lack of stipules - (2) the lack of glandular petaloid appendices - (3) are never succulents. The distribution is in America and the Old World; never in Australia.

To paraphrase Denis' opinion of Boissier's System, "nothing is more artificial than Boissier's sectioning and he has been much criticized for this - but no one has been found who would dare to improve upon it".

J. B. S. NORTON

A Revision of the American Species of EUPHORBIA of
the Section Tithymalus Occurring North of Mexico.

Missouri Botanical Garden, The Eleventh
Annual Report 1900:85-144 Plate 11-52

Norton's List of Recognized Species:

<i>lathyris</i>	Linn.	1753	384	Introduced from Europe.
<i>floridana</i>	Chapm.	1860	392	Florida
<i>inundata</i>	Torrey	1860	393	Alabama to Florida.
<i>telephoides</i>	Chapm.	1860	394	Florida, Alabama.
<i>darlingtonii</i>	Gray	1848	466	Pennsylvania to N.Carolina.
<i>platyphylla</i>	Linn.	1753	525	Introduced into U.S., Canada.
<i>obtusata</i>	Pursh	1814	528	From Iowa to Texas; Pennsylv- vania to Carolinas.
<i>arkansana</i>	Engelm.	1845	533-A	From Colorado to Kansas, Mexico, Alabama.
<i>mexicana</i>	Engelm.	1859	533-B	S.Arizona to Texas & Mex.
<i>dictyosperma</i>	Fisch.&Mey.	1835	533-C	S.Washington to L.Califor.
<i>alta</i>	Norton	1899	533-D	Mountains S.Ariz., New Mex., and Mexico.
<i>leiococca</i>	Engelm.	1859	533-E	South Texas.
<i>helioscopia</i>	Linn.	1753	539	Introduced from Europe.
<i>trichotoma</i>	H.B.K.	1817	439	Florida, W.I., East Mexico.
<i>exigue</i>	Linn.	1753	549	Introduced from Europe.
<i>helleri</i>	Millsp.	1898	549-A	S.Texas
<i>peplus</i>	Linn.	1753	556	Introduced from Europe.
<i>peplidion</i>	Engelm.	1859	559	Cent. and southern Texas.
<i>tetrapora</i>	Engelm.	1859	560	Indian Territory to Texas.
<i>longicruris</i>	Scheele	1849	562	Indian Territory and Ar- kansas to Texas.
<i>commutata</i>	Engelm.	1856	561	Penns. to N.Carolina and w. to Wisc., Texas.
<i>roemeriana</i>	Scheele	1849	533	S. Texas.
<i>crenulata</i>	Engelm.	1859	564	Calif., Oregon, Ariz., Colo.
<i>lurida</i>	Engelm.	1861	595	Mountains of Ariz., Utah, N.Mexico.
<i>palmeri</i>	Engelm.	1880	595-A	Mountains of S.Calif. to Baja Calif.
<i>surpubens</i>	Engelm.	1770	595-B	Central Arizona.
<i>schizoloba</i>	Engelm.	1861	586	So.east Calif., Arizona.
<i>montana</i>	Engelm.	1859	584	So.Utah, Colorado, Mexico.
<i>odontadenia</i>	Boiss.	1862	585	Mountains near El Paso.
<i>brachycera</i>	Engelm.	1859	582	E.New Mex., w.Texas, Mexico.
<i>chamaesula</i>	Boiss.	1860	640	S.Ariz., New Mex., n.Mexico.
<i>campestris</i>	Cham.& Schlecht.	1830	579	Mexico.
<i>robusta</i>	Engelm.	1897	584-A	E.Rocky Mt., Colo.to Montana
<i>cyparissias</i>	Linn.	1753	636	Weed naturalized from Eur.
<i>esula</i>	Linn.	1753	637	Natur.from Eur.in N.E. US.
<i>lucida</i>	Waldst.& Kit.	1802	646	Introd.from Eur. into N.Y.

Norton Synonyms:

decussata	Salisb.	384	
spongiosa	Ledeb.	384	
spaerosperma	Shuttl.	392	
pilosa	Pursh.	466	
nemoralis	Darlington	1837	466
discolor	Shuttl.		466
verrucosa	Huds.	1798	525
lanuginosa	Thuill.	1799	525
subciliata	Pers.	1807	525
coderiana	DC	1815	525
pilosa	Torrey	1826	525
obtusata	Gray	1857	525
tannensis	Hort.	1852	525
foetida	Schult.	1841	525
paniculata	Tenore		525
obtusata	Coulter	1885	533-A
multicaulis	Engelm.		533-B
dictyosperma	Engelm.	1878	533-A
dictyosperma leiococca	Engelm.	1889	533-D
dumosa	Rich.	1850	409
sagraeana	Rich.	1862	409
commutata	Coulter	1890	549-A
tetrapora	Heller.	1895	549-A
minima	Haw.	1812	556
rotundifolia	Gray	1821	556
tetnepora berlandieri	Boiss.		560
peplidion	Holzinger	1892	560
peplodes	Nutt.	1837	562
lindheimeriana	Engelm.	1862	562
ohiotica	Steud. & Hochst.	1857	561
leptocera	Engelm.	1856	564 nomen.
leptocara v. crenulata	Engelm.	1867	564
incisa	Engelm.	1861	586
montana	Engelm.	1859	584
montana glacilior	Engelm.	1859	584
fendleri	Kl. & Gar.	1860	584
chamaesula	Coulter	1890	582
campestris	Coulter	1890	582
esulaeformis	Engelm.	1859	640
campestris esulaeformis	Boiss.		640
campetris	Engelm.	1878	640
esulaeformis	Schauer	1847	579
montana robusta	Engelm.	1859	384-A
esula	Tenore		686
cyparissias	Haw. Pl. Succ.	1812	636
pensylvanica	Gandoger	1890	636
tristis	Besser	1811	637
salicifolia	DC	1815	637
angustifolia	Sweet	1827	637

Norton Synonyms: - continued

discolor	Ledeb.	1846-51	637
fleuroti	Jord.	1855	637
riparia	Jord.	1855	637
loreyi	Jord.	1855	637
ararica	Jord.	1853	637
intermedia	Breb	1859	637
pallida	Willd.Sp.Pl.	1799	646
androsaemifolia	Steud.	1841	646
virgata	Noe	1881	646
oleaeifolia	Noe	1881	646
niccaeensis	Millspaugh	1887	646

Norton trinominals

var. literata	(Jacq.)Koch	1837	of platyphylla	New Orleans
var. missouriensis	Norton	1900	of arkansana	Mo.River Valley
var. coloradensis	Norton	1900	of arkansana	Colo.,Wyo.,Utah
var. atrosemina	Norton	1900	of arkansana	Ariz.,New Mex.
var. erecta	Norton	1900	of commutata	Florida
var. franciscana	Norton	1900	of crenulata	S.Francisco Bay
var. pringlei	(Engelm.)Norton		of lurida	Mt. of Arizona
var. peplofolia	(Engelm.)Norton		of palmeri	Western Arizona
var. mollis	(Engelm.)Norton		of schizoloba	Arizona
var. trifaris	Norton	1900	of montana	S.Utah,Colo.,Mex.
var. subdentata	(Engelm.)Norton		of chamaesula	N.Mex.,maybe Ariz.
var. interioris	Norton	1900	of robusta	Colo.,Utah,Ariz.

Norton's Analytical Key (Dichotomous) - continued

- 17. Capsules slightly roughened or smooth, leaves lanceolate; over a foot high.
- 18. Stem leaves less 1.5 cm.wide. esula
- 18. Stem leaves over 1.5 cm.wide. lucida
- 15. Seeds tuberculate; low annual with acute floral leaves. exigua
- 15. Seeds with rows of pits, at least on the ventral side; annuals, usually with obtuse floral leaves.
- 16. Capsule crested. peplus
- 16. Capsule smooth, or nearly so.
- 17. Two sulci on the inner face of the seed. peplidion
- 17. Several pits on the inner face of the seed. tetrapora
- 15. Seeds irregularly covered with pits or ridges.
- 18. Thin leaved annuals.
- 19. Seeds with small deep pits.
- 20. Floral leaves very unequal, longer than the internodes. longicuris
- 20. Floral leaves nearly symmetrical, shorter than the internodes. commutata
- 19. Seeds with broad pits, and ridges between.
- 21. Floral leaves connate to the middle; in Texas. roemeriana
- 21. Floral leaves connate at the base or to the middle on one side; Pacific slope. crenulata
- 18. Perennials.
- 22. Horns of the glands longer than their body.
- 23. Seeds punctate pitted; central United States. commutata
- 23. Seeds with broad shallow pits; Pacific slope. crenulata
- 22. Horns of the glands shorter than their body.
- 24. Glands crenate and very short horned, lobes oblong.
- 25. Stem leaves widest above the middle.
- 26. Stem leaves obtuse, floral leaves broader than long.
- 27. Glabrous. palmeri
- 27. Pubescent. subpubens
- 26. Stem leaves obtuse, floral leaves as long as broad. lurida
- 26. Stem leaves acute. lurida pringlei

Norton's Analytical Key (Dichotomous) - continued

25. Stem leaves widest at or below the middle. schizoloba
24. Glands semilunate, the horns longer than the teeth, if any, between them, lobes triangular ovate.
28. Seeds large, broadly truncate at the base, capsules 5 mm. long. chamaesula
28. Seeds and capsules smaller, seeds not prominently truncate.
29. Inflorescence compact, internodes not much longer than the floral leaves, stem leaves lance-linear; Mexico. campestris
29. Inflorescence open, internodes longer than the leaves, stem leaves ovate to oblong.
30. Low, robust; northern. robusta
30. Slender; southern.
31. Stem leaves ovate to oblong. montana
31. Stem leaves small, lanceolate. odontadenia
31. Stem leaves oblong to linear. brachycera

J. B. S. NORTON'S

Synopsis of North American Species.

1. Decussatae. Stem leaves decussate, entire; glands 4, bicornute, the horns spatulate; lobes parallel veined; stamens and bracts numerous; seeds carunculate. (384) lathyris Linn.
1. Ipecacuanhae. Lurid colored, usually dioecious; stems few from a deep perennial root; stem leaves few, entire, with a narrow membranaceous marginal line; with involucre of each sex with rudimentary flowers of the other sex; glands 5, truncate; bracts small and few, or none; calyx well developed, 3-lobed; style fleshy; seeds smooth, without a caruncle.
- (392) floridana Chapman
 (393) inundata Torrey.
 (394) telephoides Chapm.
1. Galarrhoei. Stem leaves alternate, usually serrulate; lobes with a single vein or pinnately veined; glands 4 or 5, their margins rotund and entire; bracts 5, small; calyx none or discoid; seeds carunculate, usually flattened.

Norton's Synopsis of North American Species - continued
2. Perennial by a horizontal rootstock;
capsule verrucose; glands 5; rays of
the umbel 5 or more; seeds ovoid, smooth.
(466) *darlingtonii* Gray

2. Perennial by a horizontal rootstock;
capsule verrucose; glands 5; rays of
the umbel 5 or more; seeds ovoid, smooth.
(466) darlingtonii Gray
2. Annual or biennial or perhaps sometimes
perennial by crown buds; rays 5 or less;
glands usually 4, transversely elliptical
or subreniform; seeds lenticular or re-
ticulate.
3. Capsules verrucose; seeds lenticular.
 4. Leaves more or less pubescent; rays
usually 5; seeds smooth, shining, a
circular depression at the chalaza.
(525) platyphylla Linn.
 4. Rays usually 3; leaves glabrous;
seeds without a chalazal depression,
reticulate, or usually almost smooth
in E. obtusata.
 5. Seeds large, faintly veiny retic-
ulate or smooth, stem leaves
obtusate. (528) obtusata Pursh
 5. Seeds dull, brown, superficially
reticulate with all-like ridges.

6. Cymosely branched; capsule short verrucose; low
annuals or occasionally biennial.
- (533-A) arkansas Engelm.
& Gray
var. missouriensis Norton
var. coloradensis Norton
var. atrosemina Norton
(533-B) mexicana Engelm.
(533-B) dictyosperma
Fischer & Meyer

6. Racemosely branched below the small umbel; capsule long warted; a tall mountain perennial or biennial.
(533-A) alta Norton
3. Annual; capsules smooth; floral leaves widest at or above the middle; seeds deeply exsculptate reticulate.
(533-D) leiococca (Engelm.) Norton
(539) helioscopa Linn.

1. Esulae. Stem leaves alternate, usually entire; glands 4 or 5, their outer edge not rotund, entire, usually more or less bicornute; calyx inconspicuous, triangular or discoid, seeds carunculate, oblong or ovoid, circular or rhombic in cross-section.

Norton's Synopsis of North American Species - continued

7. Main stem short; leaves crenulate, most of those in the trichotomously branched umbel alternate; bracts many; seeds ovoid, smooth, caruncle small. 1817(409) trichotoma HBK
7. Rays dichotomously branched; floral leaves opposite; glands usually 4; bracts few, usually 5, sometimes obsolete; caruncle well developed.
8. Thin leaved wood or field annuals or annuals or biennials with fibrous roots; glands crescent shaped, horned; capsules subglobose; seeds variously marked, more or less flattened or angled.
9. Floral leaves acute or acuminate, very unequal; capsular angles almost acute; styles .5 mm. long, seeds tuberculate. (549) exigua Linn.
9. Leaves obtuse; capsular angles rotund; styles 1 mm. long; seeds smooth or microscopically tuberculate. (549-A) helleri Millsp.
9. Capsular angles decidedly obtuse; seeds marked with pits, some of which are in rows.
10. Capsule bicrested on the back of each coccus. (556) peplus Linn.
10. Capsule smooth or with very slight ridges on the back of the cocci. (559) peplidion Engelm.
 9. Seeds covered with irregularly arranged pits or broad ridges.
11. Seeds white, pitted with 50 to 100 small, deep pits. (562) longicruris Scheele
(561) commutata Engelm.
var. erecta Norton (ohiotica)
11. Seeds pitted with broad shallow pits with wide ridges between; leaves more or less connate. (533) roemeriana Scheele
(564) crenulata Engelm.
12. Perennial; root large; new growth formed from buds at the base of the old stems, which might in some cases be called perpendicular rootstocks; stems more or less woody and scaly at the base; leaves thick; capsules slightly narrowed below the apex, which contains the conical caruncles of the seeds; seeds vermiculate and shallow pitted to almost smooth. A group of closely related plants of the mountains and arid regions of the southwest; not easily

Norton's Synopsis of North American Species - continued

separable and often passing into one another on the borders of their ranges.

12. Perennial by a horizontal rootstock or by buds from long, horizontal roots; umbel many rayed; seeds smooth; introduced from Europe. (536) *cyparissias* Linn.

(637) *esula* Linn.

(646) *lucida* W. & Kit.

13. Usually red when young; lobes usually oblong, truncate or incised; bracts mostly broad and prominent; glands large, fan shaped or truncate, crenate margined, scarcely horned; seeds usually with oblong or irregularly shaped pits.

14. Stout plants; stem leaves broadest above the middle; leaves microscopically granulate. (395) *lurida* Engelm.

var. *pringlei* (Engelm.)

(595-A) *palmeri* Engelm.

var. *peplofolia* (Engelm.)

(595-B) *subpupens* Engelm.

14. Stem leaves elliptical lanceolate, smooth or pubescent; stems slender and often sinuous.

(586) *schizoloba* Engelm.

var. *mollis* (Engelm.)

13. Glands smaller, crescent shaped, bicornute, usually only slightly toothed between the horns; lobes triangular, rarely truncate; bracts mostly small and filiform; seeds with more rotund shallow pits.

(584) *montana* Engelm.

(585) *odontadenia* Boiss.

(582) *brachycera* Engelm.

(640) *chamaesula* Boiss.

var. *subdentata* (Engelm.)

Norton

(579) *campestris* Cham.

& Schlecht.

(384-A) *robusta* (Engelm.)

Small

var. *interioris* Norton

BOISSIER'S SECTION XXVI - TITHYMALUS 384-692SUBS. 1. Decussatae

384

Medit. annual herb. Leaves alternate. Inflorescentia
umbellate glands two-horned.

Boissier original listing

384 lathyris Linn. 1753 Italy, Mex., Peru, Chili.

Post-Boissier binominal and trinominal

384-A robusta Engelm. 1899 Colorado

384-B robusta var. inferioris Utah, Arizona

SUBS. 2. Oppositifolia

385-389

Annual herbs of Middle Asia. Leaves all opposite. Inflor-
escens dichotomous. Gland two-horned. The horns are formed
of the same material as the involucre, and very fugacious.

Boissier original listing

385 pygmaea F. et May 1839 Songaria, Turcom., Persia.

386 densa Schrenk 1841 Songaria, Tatarica, Persia.

387 sororia Schrenk 1841 Songaria, Persia.

388 turceaninovii Kar. et Kit. Songaria, Turcomania.

389 consanguinea Schrenk 1841 Songaria.

Post-Boissier binominal

386-G sarcostemmatoides Dinter 1921 Imperfectly described.

387-B triodonta Prokh. 1930

388-A aserbaidzhanica Bordz 1928 Afgan, Turks., Transcasp.

389-P platypoda Pax 1911 Kilimandscharo

389-V volkensis Pax 1895

SUBS. 3. Crotonopsidae

390

Oriental herb with Croton aspect. Leaves opposite, except
the uppermost which alternate. Inflorescens dichotomous.
Glands 4, with pectinate margin, the margin 2-8 division.
Styles short thick, recurved, undivided. Seeds leprose
carunculate. Differs from subs. Esuta by mostly opposite
leaves, inflorescens, and habit similar to Subs. 2.

Boissier original listing

390 lanata Sieber Orient, Palestina, Syria.

SUBS. 4. Ipecacuanhae
391-409

American perennial herbs or subshrubs. Lower or all staminal leaves alternate. Inflorescens dichotomous or umbellate. Glands mostly 5, transversely ovate or oblong, truncate on the external margin, frequently livid or atropurple; punctulately depressed. ("Punctato-depressae") Styles thick shortly bifid, rarely tripartite, incrassate on the tip vel capitate on the surface, stigmatose broad. Capsules generally calyculate. Seeds without caruncula. Differs from Galarrhaeus and Esula through the absence of the caruncula and through the shape of the gland.

<u>Boissier's original listing</u>			
391	ipeacuanha	Linn.	1756 N.Amer. from New York to Florida.
392	sphaerosperma	Shuttlew	Florida
393	inundata	Torrey ex Ch.	Florida
394	telephiodes	Chapm.	Florida
395	lurida	Engelm.	1861 California
396	portulacoides	Spreng.	Chili
397	caespitosa	Lam.	1786 Montevidea
398	copiapina	Philippi	1857 American, Chili
399	huanchahana	Boiss.	1862 Peru
400	erythrorhiza	Boiss.	1862 Brasilia merid.
401	andina	Philippi	1857 Chili
402	collina	Philippi	1857 Chili
403	stenophylla	Boiss.	1862 Brasilia, Rio Pardo
404	elodes	Boiss.	1860 Sto. Paulo, Minas
405	chrysophylla	Klotzsch	Brasilia, Sierra da Moeda
406	riedeliana	Boiss.	1860 Brasilia, Sierra da Lapa
407	rhabdodes	Boiss.	1860 Brasilia, Fazenda de Llama
408	papillosa	St. Hil.	1817 Florida, Cuba
409	trichotoma	H.B.K.	1817 Florida, Cuba

<u>Boissier's original trinominal</u>			
var. portulacoides	Boiss.	1862 of 391	ipeacuanha Am. bor.
var. gracilis	Boiss.	1862 of 391	ipeacuanha Am. bor.
var. acutifolia	Boiss.	1862 of 396	portulacoides Chili.
var. bridgesii	Boiss.	1862 of 396	portulacoides Chili.
var. trinervia	Boiss.	1862 of 396	portulacoides Bolivia.
var. minor	Boiss.	1862 of 404	elodes Brasilia.

Subs. 4. *Ipecacuanhae* - continued

<u>Post Boissier bi- and trinomial</u>				
391-A	arundelano	Bartlett	1911	Maryland
395-A	palmeri	Engelm.	1887	Arizona
395-B	subpubens	Engelm.	1880	C. Ariz.
396-A	pampeana	Croiz.	1943	Uruguay
396-B	patagonica	Hieron	1938	Patagonia
396-C	portulacoides	Müll. Arg.	1874	Argentina
				<i>V. obtusifolia</i> Müll. Arg., <i>V. major</i> Mill. Arg. 1874.
396-D	porphyrantha	Ph.	1895	Chili
396-E	hinkleyorum	Johnst.	1924	Argentina, Peru
396-F	evonymicarpa	Chedat & W.	1907	Argentina
396-G	boerhavioides	Busby	1907	Bolivia
397-A	caespitosa	Croiz.	1943	Uruguay
				quite close to <i>portulacoides</i> . Buenos Aires <i>ventanicola</i> Croiz.
399	nuanchahana	Boiss.	1862	Peru
	ssp. <i>typica</i>	Croiz.	1943	Peru
	ssp. <i>penaculensis</i>	Croiz.	1943	Argentina
	ssp. <i>mioides</i>	Croiz.	1943	Bolivia
400-A	duriuscula	Pax	1945	Bolivia
401-A	raphanorrhizus	Millsp.	1925	Peru
401-B	pencillatus	Millsp.	1925	Peru
407-B	refugii	Croiz.	1946	Texas
409-A	dugandiana	Croiz.	1943	Peru
				<i>Caldasia</i> II: 129, an alpine form.

SUBS. 5. *Laurifolia*

410-416

American shrubs or treelets with thick branches, leafless below and leaf carrying above. Leaves on the branches alternate, entire mostly wide. The cymes on the upper axils or subterminal corymbose, one to many headed. Involucres large. Glands 5 transversely ovate. Styles connate at the base, bifid, sometimes incrassate at the apex. Seeds smooth, always without canuculata. Differs from *Galarrhaeus*; besides a different growth habit by a more corymbose than an umbelliform inflorescens.

Boissier original listing

410	punicea	Swartz		Jamaica, Cuba, Bahama
411	calyculata	H.B.K.	1817	Mexico, Michoacan, N. Hisp.
412	latazi	H.B.K.	1817	N. Granad. Popayan
413	cestrifolia	H.B.K.	1817	American, Peru

SUBS. 5. Laurifolia Boissier's original listing - continued

414	goudoti	Boiss.	1862	N.Granad.,Mammato
415	laurifolia	Juss.	1786	Peru
416	sinclairiana	Benth.	1844	Isthmus Darien

Post Boissier binominal

410-A	troyana	Urban	1908	Jamaica	
410-B	lundelliana	Croiz.	1943	Chiopas	Wild.Nat. 29:476
410-C	gymnonota	Urban	1908	Bahamas	
411-A	elata	Brandege	1914	Mexico	
411-B	fulva	Stapf.	1907	Mexico	
412-A	apurinacensis	Croix.	1946	Peru	
413-A	cubensis	Boiss.	1866	Cuba	
413-B	podocarpifolia	Urban	1924	Cuba	
413-C	dussii	Kr. & U.	1899	Martinique	
413-D	helenae	Urban	1908	Cuba	
416-A	linearifolium	(Millsp.)	(1913)	Cuba	comb.nov.
416-B	shaferi	(Millsp.)	(1813)	Cuba	comb.nov.
416-C	mulatilla	Rusby	1910	Mexico,Sta.Catharina.	Ined.?
412-A	lehmanniana	Pax	1899	Colombia,Popayan	

SUBS. 6. Osyridae

417

Oriental shrub, with long virgate branches. Leaves alternate, cymes along the upper denudated partem of the branches alternate, thyrsoïd inflorescence forming, pedunculate 3-1 headed. Glands 5, on the margin truncate denticulate. Male bracteoles ciliate. Styles long, connate over the middle. Seeds smooth, carunculate.

417	osyridea	Boiss.	1846	Persia australis
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SUBS. 7. Pachycladae

418-431

Mostly island-dwelling shrubs of the Mediterran, Canari Islands and the Pacific. Stem thick, below mostly leafless with leafscars, above carrying the entire foliage consisting of alternate leaves. This peculiar distribution of foliage gives the dominating characteristics of this subsection. Cymes maniheaded, umbellate or paniculate. Involcrum large. Glands 4-5, entire, or truncate or twohorned. Seeds mostly carunculate. The form of the glands would put some of the species into the subs. Galarrhei, the others into the subs. Esulae, but the peculiar habitus suggests a separate subsection.

Subs. 7. Pachycladae - continued

E. obtusifolia Poir for many reasons would fit into this subsection, but because of succulent character of the young branches and the inflorescentia rather indicate relationship with *E. mauritania* of Sect. *Tirucalli*.

Boissier original listingCanari and Medit.

418	balsamifera	Ait.	Canari
419	mellifera	Ait.	Madera
420	stygiata	Wats.	Azores
421	atropurpurea	Brous.	Teneriffa
422	bourgaeana	J.Gray	Teneriffa
423	piscatoria	Ait.	Madera
424	regisjubae	Webb	Teneriffa
425	bertheloti	C.Bolle	Canari
426	tuckeyana	Steud.	Cap.Verd.
427	dendroides	Linn. 1753	Medit., Gallie aust.

Polynesian and Sunda - Species anomala

428	glaucia	Forster	Nova Zelandia
429	norfolkiana	Boiss.	Norfolk Isl.(N.of N.Z)
430	fidjiana	Boiss.	Fidji
431	plumerioides	Teysm.	Java

Boissier trinomial

419-A	var. canariensis	Boiss 1862	Teneriffa
431-A	var. homochros	Brous. 1862	Java

SUBS. 8. Carunculares

Mediterranean or Oriental herbs with umbellate terminal cymes. Leaves alternate and mostly argutely dentate. Glands entire or truncate or twohorned. The male bractcoles featherlike or lacerate. Seeds ovate with broad conical, longitudinally sulcate caruncula.

Since the insertion of these species into subs. Galarrhaeus or subs. Esulae, causes difficulty because of the variability of the shape of the gland the creation of a separate Subs. 8 Carunculares becomes more practical.

Boissier original listing

432	serrata	Linn. 1753	In cultis Lusitaniae, Hispania, Gallia
433	cornuta	Pers. 1806	In Aegypto, Arabia, Sahara
434	megalantha	Boiss. 1846	Persia
435	calyptrata	Cossan	Algeria
436	coeladenia	Boiss. 1859	Belutchistan
437	stoksiana	Boiss. 1860	Belutchistan
438	connata	Boiss. 1862	Persia

Subs. 8. Carunculares - continued

Post Boissier binominal

433-A	grantii	Oliver	1875	Tanganica Terr.
433-B	isthmia	Tackholm	1932	Egypt allied to cornata
433-C	pseudotuberosa	Pax	1908	Kalahari
433-D	multifida	N.E.Br.	1915	Natal
433-E	transvaalensis	Schlechter	1896	Transvaal
433-F	trichadenia	Pax	1894	Lunda Angela
433-G	halophila	Bornm.	1939	Iran
433-H	quintasii	Pax	1894	
433-I	noxia	Pax	1894	Somaliland
433-J	ciliolata	Pax	1898	
433-K	galpini	Pax	1898	Transvaal
433-L	gossweileri	Pax	1909	
433-M	grosseri	Pax	1904	Somaliland
433-N	huillensis	Pax	1901	Huilla
433-O	longibracteala	Pax	1898	
433-P	ledermanniana	Pax B.K.H.	1910	Tsad Zone
433-Q	graveolens	N.E.Br.	1915	Little Namaqualand
433-R	baumii	Pax	1908	
433-S	pseudo-grantii	Pax	1903	E.Africa
433-T	quintasii	Pax	1892	
433-U	scheffleri	Pax	1897	Germ., E.Africa, Kiburzi
433-V	zenkeri	Pax	1897	
434-A	multifurcata	Rech.f	1951	S.Persia Aell.Esfand.
434-B	cheirolepioides	Rech.f	1954	Persia
434-C	alaico	Prokh.	1933	Pamir-Alai
434-D	ispahanica	Boiss.	1846	Algeria, Transkaukas
434-E	grosheimii	Prokh.	1930	Beluchis., S.Trankaukas
434-F	heteradena	Jaub.Sp.	1845	Persia, Afg.
434-G	aristata	Schmath.	1892	Caucasses
434-H	riae	Pax	1922	E.Tibet, Tatien Lu
436-A	halophila	Bornm.	1939	Iran Bornm. & Gamba Fedde 4.

Post Boissier trinominal

434-A	megalantha	var. <u>hirtiflora</u>	Boiss.	1862	Assyria
		var. <u>gracilis</u>	Boiss.	1862	Persia, Ispan.
		var. <u>denticulata</u>	Boiss.	1862	Persia
437-A	stoksiana	var. <u>ovata</u>	Boiss.	1862	Beludschest.

SUBS. 9. Galarrhoei

439-546

Herbs and shrubs of the temperate zones of the entire world, but most frequent in Europe and the Orient. Cauline leaves alternate, but the higher ones sometimes verticillate. The inflorescences umbellate, but sometimes reduced to a solitary involucre. The male bracteoles hirsute or plumose. Seeds mostly carunculate.

The chief characteristic of this subsection is that the glands are transversely ovate rounded on the margin and not truncate, nor twohorned.

Subs. 9. Galarrhoei - continued

Boissier has included 118 binominals into this subsection. His further subdivision is quite artificial and is based on the character of the surface of the seeds and capsules (Semi-na laevia, minutetuberculata, alveolatim reticulato-rugosa, foveolata, transverse sulcata, longitudinaliter cristata.)

The following authors deviated from Boissier's terminology: Subs. 9. Galarrhoei

N.E. Brown in his two (1911, 1913) magnificent keys does not accept Boissier's section names and absorbs Galarrhoei in the first divisions of his key.

F. Pax (1931) retains Galarrhoei on the subsection level.

Prokhanov (1949) extended the study of Subs. Galarrhoei into Central Asia and broke it into three divisions; raising them to Section levels, using the character of capsule surface in making the divisions - as follows: Sect. Holophyllum, Sect. Tulocarpa, and Sect. Murtekias.

Smith and Tulin (1968) in Fl. Europa carries this subsection under the name of Sect. Helioscopia.

Boissier's original description of Subsection 9 Galarrhoei follows:

"Galarrhaei.--Herbae et frutices e temperatis totius orbis, in Europa et Oriente multo frequentiores. Folia caulina sparsa, varissime superiora verticillata. Inflorescentia umbellata, rarius ad involucrum solitarium reducta. Involucrum glandulae transverse ovatae, margine rotundatae, nee truncatae, nee bicornes. Bractae inter flores masculos hirsutae vel plumosae. Semen saepissime carunculatum.

Boissier's Key:

1. Seeds smooth.
2. Capsules smooth or obscurely and minutely tuberculate, but not warty.
3. Perennials 439-456
3. Annuals 457-463
2. Capsules echinulate with bristles hardened at their base. 464-465
2. Capsules covered hemispherical or cylindrical or filamentoso-elongate warts.
4. Perennials 466-524
4. Annuals 525-529

SUBS. 9. Galarrhoei - Boissier's Key - continued

1. Seeds minutely tuberculate.
 5. Capsules warty. 530-531
 5. Capsules rough. 532
1. Seeds pitted (alveolatim reticulato-rugosa)
 6. Capsules warty. 533-535
 7. Annuals 536-537
 7. Perennials 538
 6. Capsules winged. 539-542
 6. Capsules smooth. 543
1. Seeds pitted (foveolata). 544-545
 1. Seeds transversely grooved. 546
 1. Seeds irregularly crested.

Boissier's original listing

- | | | | |
|---------------------|-------------------|------|---|
| 439. himalayensis | Kl. | | Himalaya australis |
| 440. thomsoniana | Boiss. | 1862 | Tibet occidentalis |
| 441. sikkimensis | Boiss. | 1862 | Sikkim temper. |
| 442. jacquemontii | Boiss. | 1862 | Himalaya bor.-occ.-
var.lasiocarpa Boiss. |
| 443. strachei | Boiss. | 1862 | Sikkim |
| 444. tibetica | Boiss. | 1862 | Himalaya bor. occ. |
| 445. pallasii | Turcz. | | Dahuria |
| 446. rupestris | C.A.Mey.in Ledeb. | | Siberia altaica |
| 447. blepharophylla | C.A.Meyer | | Songaro, Khirgisias |
| 448. rapulum | Kar.& Kir. | 1841 | Songaria |
| 449. isatidifolia | Lam. | 1788 | Hispania orient,
Arragonia austr. |
| 450. bungei | Boiss. | 1862 | Persia bor.-var.schugna-
nica, var.megalocarpa,
var.turkestanica. |
| 451. wittmanni | Boiss. | 1860 | Transcaucasia |
| 452. cypria | Boiss. | 1862 | Ins. Cyprus |
| 453. erudescens | E.Mey. | | Cape |
| 454. pilosa | Linn. | 1753 | Europa, Sibiria-var.trigo-
nocarpa-var.reichenbach-
iana. |
| 455. altissima | Boiss. | 1844 | Lydia, Assyria |
| 456. coralloides | Linn. | 1753 | Neopolik, Sicilia |
| 457. lagascae | Spreng | 1820 | Hispania |
| 458. philipiana | Boiss. | 1862 | Andes chilenses |
| 459. arguta | Solander | | Anatolia, Syria |
| 460. ariophora | Boiss.diagn | | Asia minor |
| 461. gaillardoti | Boiss.et Bl. | | Syria, Mesopot. |
| 462. subtuberculata | C.A.Mey. | | Aderbidjan |
| 463. microspera | Boiss. | 1846 | Babilonia |
| 464. cybrirensis | Boiss. | | Asia minor |
| 465. akenocarpa | Guss. | | Hisp. australis |

Subs. 9. Galarrhoei - continuedBoissier's original listing - continued

466. darlingtonii	A.Gray	1848	Pennsylv., Carolina
467. depauperata	Hochst.	1857	Abyssinia
468. cognata	Boiss.	1862	Himalaya
469. longifolia	Don		Nepal
470. khasyana	Boiss.	1862	Khasya
471. edgworthii	Boiss.	1862	Himalaya
472. cashmeriana	Royle		Cachemiria
473. lucorum	Ruprecht		Sibiria Amurensis
474. pekinensis	Boiss.	1860	China
475. jolkini	Boiss.	1860	Japan
476. palustris	Linn.	1753	Europe, -v. eugeniae, v. carpatica
477. songarica	Boiss.	1860	Centr. Asia
478. orientalis	Linn.		Armenia
479. ceratocarpa	Ten.		Neapolitani
480. cornigera	Boiss.	1862	Cachemiria
481. hyberna	Linn.	1753	Anglia, Hibernica
482. insularis	Boiss.	1860	Corsica, Sardinia
483. alpina	C.A.Mey. in Ledeb.		Sibiria alpina-var. baikalensis
484. buchtornensis	C.A.Mey. in Ledeb.		Sibiria
485. alata	Boiss.	1860	Songaria
486. pachyrrhiza	Kir.	1840	Tarbagatai
487. macrorrhiza	C.A.Mey.	1830	Sibiria allaica
488. subamplexicaulis	Kar. et Kir.	1840	Tabagatai
489. lutescens	C.A.Mey.	1830	Sibiria allaica
490. aspera	M.Bieb.		Caucas., Persia - var. serrata Boiss. - var. oligadenia
491. macrocarpa	Boiss. et Buhse		Persia
492. fragifera	Jan		Carniae, Croatia
493. gasparrinii	Boiss.	1862	Sicilia
494. epithymoides	Jacq.		Austria, Hungary
495. lingulata	Heuffel		Banatus
496. oblongata	Griseb.		Peloponnesus-var. sessili- flora Boiss. 1862.
497. condylocarpa	Bieb.		Caucas., Persia
498. cardiophylla	Boiss.	1859	Anatolia
499. apios	Linn.		Neopolitana-var. lampro- carpa Boiss. 1862
500. polygalaefolia	Boiss. et Reut.	1860	Castell. veteris
501. uliginosa	Weber		Lusitania
502. micractina	Boiss.	1862	Himalaya
503. dulcis	Jacq.		Europa media-var. chlora- denia Boiss. 1862.

SUBS. 9. *Galarrhoei*Boissier's original listing

- continued

504. angulata	Jacq.		Austria
505. deseglisei	Boreau	1862	Gallia Centr.
506. altaica	C.A.Mey.		Sibiria altaica-var.saj-anensis Boiss. 1862.
507. carniolica	Jacq.		Alpes
508. duvalii	Lecoq.et Lamotte		Sylv.Cebennorum
509. verrucosa	Lam.		Hispan.,Gallia-var.velutina Boiss.1862
510. flavicomma	D.C.		Hispania
511. rescionensis	Boiss.	1860	Pyrenaei
512. atlantica	Cosson in litt.		Algeria-var.major Boiss.,-var.leiocarpa B.
513. welwitschii	Boiss.et Reut.		Lusitania
514. clementei	Boiss.		Hispania
515. algeriensis	Boiss.		Algeria
516. bivonae	Steud.		Sicilia,Algeria-var.papillaris Boiss.1862
517. rupicola	Boiss.		Gibraltar,Algeria-var.major Boiss.1862.
518. thammoides	Boiss.	1860	Syria
519. spinosa	Linn.	1753	Gallia,Neap.,Dalm.-var.brachiadenia,-var.inermis Boiss.
520. acanthothamnos	Heldr.in Boiss.		Graecia
521. erinacea	Boiss.et Kotschy		Antilibanon
522. schottiana	Boiss.		Taur.Ciliciae
523. chamaeuxus	Bernard		Pyrenaei
524. capitulata	Reichb.	1844	Dalmatia
525. platyphylla	Linn.	1753	Europa ad Graeciam,-var.literata Boiss.1862
526. stricta	Linn.	1753	Europa mediae,Persia
527. gaditana	Cosson		Baeticae
528. obtusata	Pursh.	1814	Am.borealis
529. coniosperma	Boiss.& Buhse		Persia
530. pubescens	Vahl symb.		Medit.-var.subglabra,-var.leucotricha,-var. crispata.
531. cossoniana	Boiss.	1862	Algeria
532. cuneifolia	Guss.	1827	Sardinia,Sicil.,Neapol.
533. dictyosperma	F.et Mey.	1835	Am.borealis
534. multicaulis	Engelm.	1859	Mexico
535. spathulata	Lam.	1786	Montevideo
536. rhytidosperma	Boiss.		Cilicia
537. jacquini	Fenzl		Hortus Vind
538. pterococca	Brot.		Lusitania Hisp.
539. helioscopia	Linn.	1753	Europa
540. berythea	Boiss.& Blanche		Syria

SUBS. 9. *Galarrhoei*Boissier's original listing

-continued

541. <i>texana</i>	Boiss.	1860	Texas
542. <i>peltata</i>	Roxb.		Coromandelia
543. <i>cassia</i>	Boiss.		Syria, Cyprus
544. <i>phymatosperma</i>	Boiss. & Gaill.		
545. <i>cernua</i>	Cosson & Durieu		Algeria
546. <i>guyoniana</i>	Boiss. & Ret.		Algeria, Sahara

Post Boissier binominal (1)

442-B <i>lasiocarpa</i>	Boiss.		Himalaya
444-A <i>tranzschettii</i>	Prokh.	1933	Tran. Shan.
444-B <i>shettöensis</i>	Pax & K.H.	1922	E. Tibet Fedde Bei XII:433.
446-A <i>mongolia</i>	Prokh.	1930	Far East Sect. <i>Holophyllum</i> -Cent., E. Asia.
446-B <i>serowschamica</i>	Rgl.	1882	As. Centr. " "
446-C <i>monocythium</i>	Prokh.	1930	As. Centr. " "
446-D <i>tianshanica</i>	Prokh.	1930	As. Centr. " "
446-E <i>prokhanowu</i>	M. Pop.	1938	As. Centr. " "
446-F <i>rosularis</i>	A. Theod.	1841	As. Centr. " "
446-G <i>komaroviana</i>	Prokh.	1949	Far East " "
447-A <i>ferganensis</i>	Fedtsh.	1916	Tian Shan. Pam. " "
447-B <i>lipskyi</i>	Prokh.	1933	Pam.-Al. " "
450-A <i>schugnanica</i>	Fedtsh.	1916	As. Centr.
450-B <i>turkestonica</i>	Rgl.	1882	
450-C <i>megalocarpa</i>	Rech. f.	1863	Afganistan
450-D <i>alaica</i>	Prokh.	1933	Pam.-Al.
454-A <i>semivillosa</i>	Prokh.	1933	
454-B <i>villosa</i>	W. et Kit.	1807	illyrica Lam., S. Russia.
456-A <i>carpatica</i>	Wolostcz	1892	W. Carpat.
456-B <i>tauricola</i>	Prokh.		
463-A <i>unilateralis</i>	Blakelock	1948	Palestine Kew. Bulletin.
467-A <i>platycephala</i>	Pax	1894	Germ., E. Africa
467-B <i>lepidocarpa</i>	Pax	1904	Somali
467-C <i>trachycarpa</i>	Pax	1904	East Ukinga
467-D <i>usambarica</i>	Pax	1894	-var. <i>elliptica</i> - W. usambara -Jahrb. XIX:12.
467-E <i>macrophylla</i>	Pax	1894	Afr. Trop.
467-F <i>ugandensis</i>	Pax	1910	
467-G <i>membranocea</i>	Pax	1895	Usb.
467-H <i>pseudo-engleri</i>	Pax	1909	
467-I <i>engleri</i>	Pax	1895	
475-A <i>japonica</i>	Siebold		Japan
475-B <i>lasiocaula</i>	Boiss.	1866	Japan
476-A <i>sauliana</i>	Bureau		Lydia
476-B <i>eugenia</i>	Prokh.	1949	W. Transkauk.

SUBS. 9. GalarrhoeiPost Boissier binominal continued

476-B sauliiana	Boreau	Lydia
476-C carpatica	Wolosztcz	1892
477-A aristata	Schmalk	1892
479-A calonesiaea	Croiz.	1938 Formosa
481-A greyersonic	K.Maly et G.Beck	1920
483-A talestavica	Prokh.	1953
483-B baicalensis	Boiss.	1862 Dahuna
483-C transvaalensis	Schlech.	1896 Transvaal
490-A scripta	Soum.& La.	1892
490-B serrata	Boiss.	
490-C oligedenia	Boiss.	
491-A wallichii	Hook.f.	1890 Afghan,Pakistan,Nepal.
491-B tranesxana	Prokh.	1930 Tian Shan,Pam.-Al.
491-C kurdjaschevii	Prokh.	Pakistan,Pam.-Al.
491-D mulronulata	Prokh.	1930 Pakistan
492-A polychroma		
492-B montenegrina	(Bald.)K.Maly ex Rohlena	1912 Jugslavia
494-A polychroma	Kern	
494-B villosa	Frivaldsky non. W.K.	
496-A pilosa	Bor.et Chaub.	
496-B erioclada	Boiss.et Heldr.	
496-C sessiliflora	Boiss.et Sprun,Diago.V	
497-A amplexicaulis	Ledeb.	
499-A pubigera	Friwaldski	
499-B lamprocarpa	Boiss.	Anatolia Dribalk,TianShan
503-A chloradenia	Boiss.	Croatia
506-A sajanensis	Boiss.	in montibus Sajanensibus
509-A velutina	Boiss.	
509-B demitensis	Boiss.	1879 Asia minor
512-A major	Boiss.	Prope Batus
512-B leiocarpa	Boiss.	in monte Jurgens
516-A glabrifolia	Vis	
516-B papillaris	Boiss.	in Insulis Malit
518-A inermis	Ponice in litt.1866	Serlinansis
518-B inermia	Pax	Serbia
519-A glabriflora	Vis	1864 Balkan
535-A heterodoxa	Müll.Arg.	1895 Brasil
539-A hausknechtii	Boiss.	1866 Aleppo
539-A oxyodonta	Boiss.& Hausknecht	Aleppo
543-A caudata	Boiss.& Hausknecht	Aleppo
509-C djimilensis		Fl.Orient:1104

SUBS. 9. Galarrhoei - Post Boissier binominal - continued

525-A	flavorpurpurea	W.et Kit.	
533-A	arkansana	Engelm.et Gray 1845	Colo.,Kans., Norton 1899 Missouri.
533-B	mexicana	(Engelm.)Norton	Ariz.,Tex.,Mexico, Norton 1899.
533-C	leiococca	(Engelm.)Norton	Texas (Norton)
533-D	alsa	Norton 1899	Ariz.,N.Mex.,Mex.,S.Tex.
539-A	hausknechtii	Boiss. 1866	Aleppo
539-B	oxyodonta	Boiss.et Hausknecht 1866	
539-C	heliocopioidea	Las.et Parol	Boiss. 1866
539-D	guestii	Blaklock 1942	Iraq
539-E	schugnomica	Feoltschenks 1916	
539-F	turkestanica	Regel 1882	Turk.,Transcaspia,Tian Shan,Pam.-Al.

SUBS. 10. Esula

547-685

The chief characteristic of this subsection is: Margin of glands not rotund nor entire, usually bicornate.

The distinction between Galarrhoei and Esula is quite sharp and clear in Europe where it was originally discovered and considered important enough to be studied. This distinction becomes less and less definite when carried eastward into Asia. Boissier, Berger and Pax are still keeping this distinction, but Prokhanov (1933,1949) has given it up and has broken up Esula into: Sect. Murtekias, Esula Herpetorrhiza and Cymatospermum.

Boissier (1862) subdivided Esula into groups based on the texture of seed surface. More than half of the species have seeds with smooth surfaces, and the remaining seeds have tuberculate, sulcate, and foveolate surfaces.

Pax in 1931 did not use Boissier's subdivision but grouped the species geographically.

Smith and Tutin in Fl. Europa 1968 tried to adopt Prokhanov's ideas.

Norton in 1899 adopted Boissier's system to the Sect. Tithymalus north of Mexico. He defined Esula with the words "the outer edge of the glands not rotund entire bicornate"; left the subsections practically as Boissier defined it, only he took 409 E. trichotoma HBK 1817 out of Boissier's subs. 4 (Ipecacuanha) because of the very small carunculate seeds and transferred it into Tithymalus Sect. XXVI, Subs. 10 Esula.

Subs. 10. Esulae.-- Herbae et frutices e temperatis totius orbis. Folia caulina sparsa, rarissime superiora verticillata. Inflorescentia umbellata, rarissime dichotoma. Involucri glandulae margine truncatae

Subs. 10. Esulae - continued

vel retusae vel plus minus longe bicornutae. Bracteolae inter flores masculos hirsutae vel plumosae. Semen saepissime carunculatum. (Cornua saepius e substantia glandulae, rarius membranacea discoloria e substantia involucri ipsius formata transitum ad appendicem petaloideam sectionum priorum generis praebentia; haec cornuum duplex origo caeterum in Esulis parum gravis est et in speciebus valde affinibus occurrit.)

Herbs and shrubs of the entire world. Cauline leaves alternate, the upper ones rarely verticillate. Inflorescent umbellate, rarely dichotoma. Male bracteoles hirsute or plumose. Seeds mostly carunculate.

"Cornua saepius e substantia glandulae, rarius membranacea discoloria e substantia involucri ipsius formata transitum ad appendicem petaloideam sectionum priorum generis praebentia; haec cornuum duplex origo caeterum in Esulis parum gravis est et in speciebus valde affinibus occurrit".

This double origin of the horns is considered unimportant because it occurs in very closely related species.

Geographically. Mostly Eurasian (60), American (15), African (12), Pacific (2) Mediterranean (30) Oriental (25) Central and N. European (15)

Boissier has 139 binominals, and 61 trinominals in his subs. 10 Esula (547-685). This he subdivided, based on the texture of the seed surface. More than (70) smooth; the rest tuberculate (5) longitudinally or transversely sulcate (54), irregular foveolate.

Prokhanov (1933, 1949) elevated subs. Esula to higher rank in subdividing Esula into four subsections:

Sect. 8 Cymatospermum (549-590); Sect. 5 Murtekias (595-690); Sect. 6 Esula (634-676); and Sect. 7 Herpetorriza 612-B C D.

Smith and Tutin Fl. Europea (1968) Sect. Cymatospermum (Prokh.) Prokh. (547-572); Sect. Paraliae (palmately veined) (573-625); Sect. Esula (pinnately veined) (625-680).

Subs. 10. Esula - continuedBoissier's original listing.Boissier's Key:

547-685

- | | |
|--|---------|
| 1. Seeds tuberculate - Annuals | 547-551 |
| 1. Seeds transversely grooved. | 552 |
| 1. Seeds longitudinally grooved or with longitudinal series of pits. | 553-560 |
| 1. Seeds irregularly arranged pits, wrinkled. | |
| 2. Annuals | 561-573 |
| 2. Perennials | 574-614 |
| 1. Seeds smooth. | |
| 3. Floral leaves | 615-672 |
| 3. Floral leaves connate. | 673-685 |

- | | | | | |
|-----|----------------|-------------------|------|---|
| 547 | aleppica | Linn. | 1753 | Calabria, Dalmatia |
| 548 | parvula | Delil. | | Egypt |
| 549 | exigua | Linn. | 1753 | Europa-var. retusa Roth,
tricuspidata K. |
| 550 | globulosa | Cosson et Durieu | | Tunis, Algeria-var. peplidia |
| 551 | dracunculoides | Lam. | 1817 | India |
| 552 | calcata | Linn. | 1753 | Lusitania-var. minor Koch
-var. rubra Boiss.-Hispan. |
| 553 | sulcata | deLens | | Algeria |
| 554 | aulacosperma | Boiss. | 1862 | Hierosolyma-var. fossulata
Boiss. Damasc. |
| 555 | maddenii | Boiss. | 1862 | Himalaya |
| 556 | peplus | Linn. | 1753 | Europa-var. maritima
Boiss. Byzantium |
| 557 | peplioides | Gouan | | Medit., Gallia |
| 558 | chamaepeplus | Boiss. et Gaill. | | Palestina-var. sinaica
Boiss. 1862 |
| 559 | peplidion | Engelm. | 1859 | Texas |
| 560 | tetrapora | Engelm. | 1859 | Georgia, Louisiana-
var. berlandieri Texas. |
| 561 | ohiotica | Steud. et Hochst. | 1857 | Amer. sept. |
| 562 | longicruris | Schleele | 1849 | Texas |
| 563 | roemeriana | Schleele | 1849 | Texas |
| 564 | leptocera | Engelm. | 1859 | Calif.-var. crenulata
Engelm. 1862. |
| 565 | ledebourii | Boiss. | 1860 | Tauria |
| 566 | szowitsii | F. et Mey. | | Anatolia |
| 567 | punctata | Delile | | Egypt |
| 568 | hieroglyphica | Coss. et Durieu | 1862 | Algeria |
| 569 | medicaginea | Boiss. | | Baetica |
| 570 | taurinensis | All. Ped. | | Galloprovincia |
| 571 | graeca | Boiss. et Sprun. | 1844 | Dalmatia, Graecia, Serbia |
| 572 | reuteriana | Boiss. | | Palestina |
| 573 | segetalis | Linn. | 1753 | Europa-var. longibracteata
Boiss. 1862. |

Subs. 10. *Esula* -Boissier's original listing - continued

574	portlandica	Linn.	1753	Anglia, Lusitania
575	pineae	Linn.	1753	Lusitania-var. azorica Boiss. 1862.
576	buimbellata	Poir.		Corsica
577	cerebrina	Hochst.	1850	Abyssinia
578	meyeri	Boiss.	1860	Cape
579	campestris	Cham., et Schlecht.		Mexico-var. esulaeformis Boiss. 1862, -var. seemani Boiss.
580	furcillata	H.B.K.	1817	Mexico
581	orizabae	Boiss.	1862	Mexico
582	brachycera	Engelm.	1859	New Mexico
583	greggii	Engelm. in litt.	1862	Mexico
584	montana	Engelm.	1859	Mexico, New Mexico
585	odontadenia	Boiss.	1862	New Mexico
586	schizoloba	Engelm.	1861	California
587	pithyusa	Linn.	1753	Medit. -var. procera Corsica.
588	cupani	Guss.		Sicilia-var. spartioides Boiss.
589	imbricata	Vahl.		Lusitania
590	matritensis	Boiss.	1860	Hispania
591	transtagana	Boiss.	1860	Lusitania
592	baetica	Boiss.	1860	Hispania
593	buplevroides	Desf.		Afr. borealis
594	luteola	Cosson et. Dull.	1853	Algeria
595	petrophila	C.A. Mey.		Tauria
596	pestalozzae	Boiss.	1860	Lyciae
597	erythrodon	Boiss. et Heldr.		Pisidiae
598	decipiens	Boiss. et Buhse		Persia
599	polycaula	Boiss. et Hohen.		Persia
600	bothriosperma	Boiss. et Kotschy	1860	Armenia
601	cheiradenia	Boiss. et Hohen.		Persia, Elbrus
602	chesneyi	Boiss.	1862	Assyria
603	malleata	Boiss.	1862	Persia
604	erythradenia	Boiss.	1860	Persia, -var. obovata Boiss. 1862.
605	striatella	Boiss.	1862	Persia, -var. microsciadia Boiss. -var. persepolitana Boiss.
606	plebeia	Boiss.	1860	Persia
607	humilis	C.A. Mey.		Songaria, Kihirgizia.
608	obovata	Decsne	1834	Sinai
609	teheranica	Boiss.	1862	Persia
610	deflexa	Sibth. et Sm.		Graecia
611	canaorica	Boiss.	1862	Himalaya
612	bounophila	Boiss.	1862	Persia, -var. aucheri Boiss.
613	caudiculosa	Boiss.	1862	Libanoa
614	herniariaefolia	Willd.		Graecia, -var. hebecarpa

Subs. 10. Esula -Boissier's original listing - continued

615	schimperiana	Hochst.	1842	Abyssinia
616	monticola	Hochst.	1844	Abyssinia
617	dilatata	Hochst.	1842	Abyssinia
618	repetita	Hochst.	1842	Abyssinia
619	yemenica	Boiss.	1860	Arabia
620	rothiana	Spreng.		India
621	oreophila	Mig.		India, -var. pubescens Boiss. -var. wightiana Boiss.
622	borbonica	Boiss.	1862	Ins. Bourbon
623	javanica	Jungh.	1847	Java
624	nepalensis	Boiss.	1862	India
625	terraccina	Linn.	1753	Regio Medit. -var. ecarunculata Boiss., -var. modesta Boiss.
626	trapezoidalis	Viv.	1865	Tripolitania
627	sieboldiana	Morren et Des.	1836	Japonia
628	gayi	Salis	1834	Corsica
629	variabilis	Cesati		Insubria (L. Moggiore)
630	leptocaula	Boiss.		Tauria (crimaea) Inter Ural et Wolg., -var. praecox Boiss.
631	sareptana	Becker		Sarepta
632	undulata	Bieb.		Sarepta
633	tenuifolia	Lam.		E. France
634	virgata	W. et Kit.		Hungaria, -var. montana Reich. Illyria, -var. orientalis, -var. ucalensis Boiss.
635	hebecarpa	Boiss.	1846	Persia
636	cyparissias	Linn.	1753	Europa media, -var. major Boiss. 1862 Neapolit.
637	esula	Linn.	1753	Europa, var. -genuina, -var. mosana, -var. latifolia, var. -pinifolia, -var. cyparissiodes, -var. caesia.
638	latifolia	C. A. Mey.		Siberia Altaica, -var. intermedia.
639	subcordata	C. A. Mey.		Songania, -var. eriophylla Boiss.
640	chamaesula	Boiss.	1860	New Mexico
641	lunulata	Bunge		China borealis
642	salicifolia	Host.	1797	Austria, Hung., Banat., -var. angustata Rochel.
643	androsaemifolia	Schousb.		Lusitania
644	filicina	Portenschl.		Dalmatia, val. alpina, - -var. montana Boiss.
645	iberica	Boiss. aut.	1860	Caucas., -var. intermedia Boiss. 1862.

Subs. 10. *Esula* -Boissier's original listing - continued

646	<i>lucida</i>	W.et.Kit.	1802	Europa, -var. <i>salicifolia</i> Wimm.et Grab. -var. <i>esula-lucida</i> .
647	<i>agraria</i>	M.Bieb.	1808	Transylv.Caucas.
648	<i>thyrsoidea</i>	Boiss.	1862	Himalaya
649	<i>nevadensis</i>	Boiss.		S.Nevada, -var. <i>arrazon-</i> <i>ensis</i> Boiss.
650	<i>saxatilis</i>	Jacq.	prope	Viennam, -var. <i>carnica</i> Biss.
651	<i>pauciflora</i>	L.Dufour	1860	Hispania
652	<i>baselicis</i>	Ten.		Neapolitania, -var. <i>rupes-</i> <i>tris</i> Boiss. Macedonia.
653	<i>triflora</i>	Schott.		Velebit
654	<i>orphanidis</i>	Boiss.diagn.		Parnassus
655	<i>nicaensis</i>	All.Ped.		Lusitania
656	<i>glareosa</i>	Bieb.		Austr.Transcauc., -var. <i>las-</i> <i>iocarpa</i> Boiss.1862.
657	<i>tinctoria</i>	Boiss.et Huet.	1853	Anatolia, -var. <i>schiz-</i> <i>oceras</i> Boiss.1844.
658	<i>gerardiana</i>	Jacq.		Seguieriana Neckav., -var. minor Duby, -var. <i>hohenack-</i> <i>eri</i> Boiss., -var. <i>finma</i> Boiss.
659	<i>buhsei</i>	Boiss.		Persia, -var. <i>lasiostemon</i> Boiss.
660	<i>paralias</i>	Linn.	1753	Europa australis
661	<i>ovata</i>	E.Mey.		Cape
662	<i>genistoides</i>	Linn.mantissa		Cape, -var. <i>major</i> Boiss., -var. <i>leiocarpa</i> Boiss.1862.
663	<i>corifolia</i>	Lam.	1788	Cape
664	<i>ericoides</i>	Lam.	1788	Cape
665	<i>epicyparissias</i>	E.Mey.	1843	Cape
666	<i>involucrata</i>	E.Mey.	1843	Cape
667	<i>dumosa</i>	E.Mey.	1843	Natal
668	<i>wahlbergii</i>	Boiss.	1862	Natal
669	<i>erythrina</i>	Link.		Cape
670	<i>salerophylla</i>	Boiss.	1860	Cape, -var. <i>ruscifolia</i> Boiss. -var. <i>myrtifolia</i> .
671	<i>striata</i>	Thunb.		Cape, -var. <i>cuspidata</i> , -var. <i>brachyphylla</i> .
672	<i>natalensis</i>	Bernh.	1845	Natal.
673	<i>amygdaloides</i>	Linn.	1758	Europe-var. <i>chaixiana</i> Boiss. -var. <i>ligulata</i> Boiss.
674	<i>semiperfoliata</i>	Viv		Sardinia, Corsica
675	<i>iteophylla</i>	Boiss.	1860	Iberia
676	<i>macroceras</i>	Fisch.et Mey.		Iberia
677	<i>rumicifolia</i>	Boiss.	1860	Armenia
678	<i>kotschyana</i>	Fenzl		Anatolia
679	<i>macrostegia</i>	Boiss.	1862	Libanon
680	<i>characias</i>	Linn.	1753	Mediterr.

Subs. 10. Esula -

Boissier's original listing - continued

681	wulfenii	Hoppe		Illiria, Dalmatia.
682	sibthorpii	Boiss.	1860	Graecia
683	melapetala	Gusparr.	1830	Sicilia
684	lycia	Boiss	1862	Asia minor, Lycia
685	heldreichii	Orphanides	1860	S. Graecia; Laconia, -var. roeseri Boiss.

Post Boissier binominal

547-579

547-A	eggersi	Urban	1899	Sto Domingo
547-B	turckheimii	Urban.	1917	Sto Domingo
547-C	condensata	Fisch.	1819	Iran, aleppica 547
547-D	greggii	Scheele		Arkansas, Texas
549-A	helleri	Millsp.	1898	Texas, Corpus Christi
551-A	perbracteata	Gage	1914	Bombay. Confused with dracunculoides Lam.
551-B	ensifolia	Baker	1884	Madag.
552-A	franchelii	Fedtschenko	1916	Iran, Turkestan, Afganistan, Pam.-Al.
552-B	acuminata	Lam.	1786	
556-A	pseudopeplus	Spreng.	1902	Patagonia
557-A	rotundifolia	Loisel	1809	
558-A	chamaepeploides	Lotsy	1895	Guatemala, Chimaltenango
561-A	commutata	Norton	1899	Florida -var. erecta
561-B	austrina	(Small)	1902	Florida
562-A	normanni	Schmalk et Lipski	1891	
564-A	crenulata	var. franciscana Norton	1899	San Francisco Bay, -leptocera Engelm. 564.
564-B	nortoniana	Nelson	1909	California Bot. Gar. 47:457
564-C	manca	Nelson	1909	California Bot. Gar. 47:457
564-D	palmeri	Engelm. et Watson	1880	California
564-E	robusta	(Engelm. 1859) Small	1897	Colorado to Montana.
564-F	crenulata	(Engelm. 1899)		Colorado to Montana.
566-A	densiuscula	M. Pop	1922	
566-B	gypsicola	Rech. f.	1951	Iran -related to szowitsii
567-A	punctata	Delile		
567-B	ruderalis	Scheele	1843	
567-C	arvalis	Boiss., Heldr.	1852	Iran
569-A	parvula	C. Koch	1848	
579-A	longecornuta	Wats.	1890	Mexico; Chihuahua -cam- pestris 579 Cham. et Schlecht.

Subs. 10. Esula -Post Boissier binominals (2)

580-599

584-A	crinulata var. Trifaritis Norton	1899	N.Mex., Arizona
584-B	incisa Engelm.	1860	Colorado
584-C	robusta (Engelm. 1859) Small		Colorado
584-D	multicaulis Engelm.	1859	Sonora
586-A	crenulata var. mollis Engelm.	1887	Arizona -schigoloba Engelm. 1861.
586-B	steyermarkii Standl.	1944	Guatemala
586-C	subpubens Engelm.	1880	California
586-D	eggersi Urban	1899	Sto Domingo
586-E	turckheimi Urban	1912	Sto. Domingo
589-A	pauciflora L. Duf.	1860	Hispania
593-A	ornata Stapf	1886	
595-A	palmeri Engelm.	1880	
598-A	sahandi Bornm.	1910	Iran

Post Boissier binominal (3)

600-610

601-A	lewendica Stapf	1886	Iran
601-B	longecorniculata Kitam	1958	Afghanistan
604-A	gedrosiaca Rech.f.	1951	Iran
604-B	aellenii Rech.f.	1951	Iran
604-C	maturensis Rech.f.	1963	Afghanistan
604-D	volkii Rech.f.	1963	Afghanistan
604-E	megalantha Boiss.	1846	Iran
604-F	var. gracilis Boiss.	1879	Iran
605-A	kopetdaghi Prokh.	1933	Turcomania
605-B	yamashitae Kitam	1958	Afghanistan
605-C	striata Boiss.	1846	Iran -microsciadica Boiss. 605.
605-D	striatella Boiss.	1862	Iran
605-E	kazerouni Parsa	1943	Iran -var. stricta Parsa 1948.
605-F	persepolitana Boiss.	1846	Iran

Post Boissier binominal (4)

610-629

610-A	curdica Boiss. & Haukm.	1879	Fl. Orient
611-A	kurdica Boiss. & Haukm.		
612-A	bounophita Boiss.	1862	
612-B	chasmophila Rech.f.	1951	Iran
612-C	audreri Boiss.	1843	Iran, Turkey
612-D	bouniphilla var. aucheri Boiss.	1862	Iran
612-E	deltobracteata Prokh.	1933	Iran, Turkmenia
612-F	litwinowii Prokh.	1932	Iran
612-G	quinquerastiata Kitam.	1958	Afghanistan
612-H	polytimetica Prokh.	1933	

Subs. 10. Esula -Post Boissier binominal (4) - continued

612-I	monticola	Boiss.	1846	Iran
614-A	mareshi	Knoche	1922	Isles Baleares
614-B	rimanum	Coss.		
615-A	hochstetteriana	Pax	1894	Jahrb.19:121
615-B	reineckii	Pax	1898	Samoa.Jahrb.25:648
616-A	longepetiolata	Pax et K.H.	1910	Kamerun Jahrb.45:241
616-B	bachmannii	Pax	1897	Monticolo Jahrb.23:535
616-C	buchanani	Pax	1901	Jahrb.28:27
616-D	cyparissioides	Pax	1894	Centr.Afr. Jahrb.19:128
616-E	lehmbachii	Pax	1901	Kamerun Jahrb.28:27
616-F	preussii	Pax	1894	Kamerun Jahrb.19:123
616-G	velutina	Pax	1895	East Afr. Jahrb.45:242
616-H	stuhlmanni	Pax	1897	Uloguru
616-I	kilimandscharica		1895	
619-A	ampla	Hook.f.	J.Proc.Lenn.Soc.VI:20	
623-A	borborica	Boiss.	1862	La Reunion offira a rothiana Miq. 623.
624-A	prolifera	Buch-Ham et D.Don		W.China, Siam
627-A	savari	Kiss.	1921	

Post Boissier binominal (5)

630-639

630-A	astrachanica	C.A.Mey.ex Prokh.	1851	Cam et Claus	630-B
630-B	cenuifolia	M.B.	1808		
630-C	cyrtophylla	Prokh.	1930		
630-D	guntensis	Prokh.	1933		
630-E	tshuiensis	(Prokh.)Serg.	1935		
632-A	buschiana	Grosch.	1940		
632-B	irisensis	Linn.	1922		
633-A	longepetiolata	Jones	1933	Gadalajara	
633-B	graminifolia	Vill.		-tennifolia	
634-A	uralensis	Fisch.et Link	1822	S.E.,E.C. Europa	
634-B	boissieriana	Prokh.	1949	Iran. (Woron.1931)	
634-C	jaxartica	Prokh.	1933		
634-D	tommasiniana	(Bortd.)	1881	Nyman	
634-E	zhigullusis	Prokh.	1941		
634-F	emirnensis	Baker	1884		
635-A	pamirica	Prokh.	1941		
636-A	ericifolia	Pax	1904	Germ.E.Afr.	
636-B	uhehensis	Pax	1904	Uhehe,Ulugun Seb.	
637-A	caesia	Led.			
637-B	brevicornu	Pax	1909		
637-C	subtilis	Prokh.	1941		
637-D	karoi	Freyn	1896		
637-E	borszczowii	Prokh.	1949		
637-F	microcarpa	Prokh.	1933		
637-G	podperae	Croiz.	1947	Olomouc	
637-X	var.saliatorum	Jord.	sparadoxi	Stm.	
637-Y	saricola	A.A.Smith	1971	Siam	K.B.25:55

Subs. 10. *Esula* -Post Boissier binominal (5) - continued

638-A	kopetdaghi	Prokh.	1932	
638-B	szchuanico	Pax et K.H.	1933	East Tibet
638-C	borodini	Saurbuk	1928	
638-D	niciciana	Borb.	1893	
638 E	poecilophylla	Prokh.	1932	
640-A	var. subdentata	Engelm.	1859	New Mex.- Norton 1899
642-A	glomerularis	Prokh.	1933	
642-B	sanasunitensis	Hand.Mae.	1912	Kurdista
644-A	sublastata	Visiani		Servia - Boiss. 1866
645-A	pseudograria	Maxim.	1884	
646-B	sewerzowii	Herd.	1933	
650-A	salatitidis	Boiss.		Corsica
651-A	valliniana	Belli	1903	S.W.Alps
652-A	turkestanica	French		Iran
652-B	kernerii	Herd		
654-A	bessarabica	Klokov	1955	S.W.Uraina
656-A	stepposa	Zoz	1949	
656-B	esuloides	Vel.		
656-C	goldii	Prokh.	1949	
656-D	volgensis	Krysht.	1929	
657-A	froedini	Rech.f.		Iran
657-B	damascena	Boiss.	1853	Iran
657-C	cinctoria	Boiss.	1862	Iran
657-D	macroclada	Boiss.		
657-E	schizoceras	Boiss.	1844	Iran
658-A	esula	Auct.		Orient, Iran
658-B	ecorniculata	Kitam.	1958	Iran
658-X	var. Orientalis	Boiss. 1862		Iran
658-C	fuhsii	Bornm.	1916	Iran
658-D	hypolena	Prokh.	1933	Iran
658-E	ssp.hohenackeri			
658-F	ssp. niciciana (Borb)	Rech.f.		Iran
658-G	osyridiformis	Parsa		
658-J	seguirensis	Nech.		
658-K	virgata	W.Kit.	1805	Iran Auct.Orient

Post Boissier binominal (6)
(660-685)

673-A	micans	Scheele	1847	Iran
673-B	sylvatica	Linn.	1753	
673-C	amygdaloides	var.oblongifolia (Koch)	1847	Iran
673-D	oblongifolia	CKoch	1848	Iran
674-A	emirensis	Bowrn.		
677-A	rumicifolia	Boiss.	1860	Iran
679-A	erubescens	Boiss.	1847	syn.of 679 macrostegia May Iran.
683-A	spinidens	Bornm.	1933	
685-A	micella	Wats.	1891	State of Mexico

SUBS. 11. Myrsinitae

686-692

Herbs mediterranean and Oriental. The bracts between the male flowers obsolete. Very similar to *Esulae*. The glands pectinate or bicornute on the margin.

1. Seeds vermiculate rugose

686	<u>E. myrsinites</u>	Linn.	1753	Dalmat., Sicilia, Balkan, Krym. aust.
687	<u>E. anacampseros</u>	Boiss.	1844	Anatolia, Paphlagonia
688	<u>E. denticulata</u>	Lam.	1788	Iraq., Iran, Armenia, Cappadocia.

1. Seeds tuberculate

689	<u>E. craspedia</u>	Boiss.	1846	Assyria
690	<u>E. corsica</u>	Requiem	1825	Corsica

1. Seeds smooth

691	<u>E. marschalliana</u>	Boiss.	1846	Iran, Turkestan
692	<u>E. biglandulosa</u>	Desf.	1808	Sicilia

Post Boissier binominal

686-A	<u>E. oxyphylla</u>	Boiss.	1866	Hispania
686-B	<u>E. proteri</u>	Daveau	1885	E. Porteg. - nicaersis
686-C	<u>E. pontica</u>	Prokh.	1949	Caucas, Asia minor
686-D	<u>E. woronowii</u>	Grosch	1916	Krym., Caucas.
687-A	var. minor	Boiss.	1844	Cappadocia
688-A	<u>E. cilicica</u>	Boiss.	1844	Mediterr.
688-B	<u>E. spinidens</u>	Bornm.	1933	Pam.-Al., Afg. ex Prokh.
688-C	<u>E. sogdiana</u>	M. Pop.		
689-A	<u>E. craspedia</u>	Boiss.	1846	
691-A	<u>E. monostyla</u>	Prokh.	1949	Turkmania
691-B	<u>E. armena</u>	Prokh.	1949	Caucasus
691-C	<u>E. pectinata</u>	Albofi	1894	Sicilia
680-A	<u>E. eriocarpa</u>	Bertol	1839	

SECT. XXVII. CALYCOPEPLUS

693

Calycopeplus -- Folia verticillata, suprema opposita.

Stipulae minimae, Cymae axillares ad involucra solitaria reductae. Fasciculi florum masculorum singuli bracteis inclusi. Glandulae exappendiculatae. -- Frutex Novo-Hollandicus.

693 E. paucifolia Klotsch Australia, Swan River.

This section XXVII Calycopeplus has been elevated to the rank of a genus and excluded from EUPHORBIA.